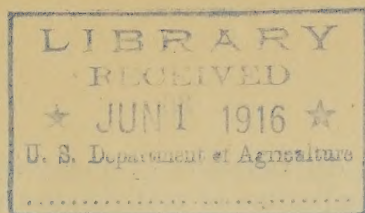


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## THE USE OF CONCRETE ON THE FARM.

### SUGGESTIONS FOR TEACHING THE SUBJECT IN SECONDARY SCHOOLS.

#### INTRODUCTION.

Although the use of concrete on the farm has increased rapidly within the last few years, there is not yet as wide a use of this building material in rural districts as is merited by its value. In some cases prejudice has arisen because poor results have been obtained. Such results are due in most cases to ignorance of proper methods and poor workmanship. Rural high schools may do much toward increasing both the quality and the quantity of concrete construction in the community. The farmers may often be reached through their sons. There is little work which may be given in an agricultural course that has a wider application than practical concrete construction. No matter how extensive or how limited the course may be and no matter what phase of agriculture may be emphasized, some work along this line will fit in with the course and aid in giving it a practical bent.

#### RELATION OF SUBJECT TO COURSE OF STUDY.

*Relation to courses in agriculture.*—Concrete construction is a phase of rural engineering. Where a special course is given in this subject, one or more general lessons upon the use of concrete should be given as a partial basis for the phase of the course which deals with farm structures. In the teaching of concrete construction in such a course there should be correlation with instruction given in other courses. If such work as the making of feeding floors, dipping vats, or feed troughs is selected, it should be in cooperation with the class in animal husbandry. Dairy and poultry houses, greenhouses, and hotbeds should be built according to plans considered in the courses which deal with those subjects. Where a course in rural engineering is not given, the use of concrete may be taken up in connection with other courses in agriculture. If only one year of general agriculture is given, there will be time enough for only one or two general lessons on the subject with application to such simple construction as may be needed at the school or on a near-by farm.

*Relation to other courses.*—An understanding of the process of manufacture and use of cement is based upon principles usually considered in secondary courses in chemistry and physics.



The planning of structures with a determination of quantities of materials to be used presents an opportunity for a practical application of mathematics which should not be neglected in teaching that subject in secondary schools. If the agricultural students have not had sufficient chemistry, physics, and mathematics to understand the principles involved it will be necessary for the teacher of agriculture to give more attention to those principles. Such questions as the following will aid in bringing out the application of chemistry and physics to concrete construction: How does cement differ from lime in composition? Why will concrete set under water when plaster requires dry air? Why does concrete often crack upon drying? The students should make measurements of forms to be constructed and determine the amount of material to be used.

#### CLASSROOM INSTRUCTION.

The use of concrete is essentially a practical subject, yet some time may be given in the classroom to a discussion of the directions and the processes involved in connection with practice. Farmers' Bulletin 461, The Use of Concrete on the Farm, may be made the basis of the discussion. This bulletin should be supplemented with other department bulletins listed at the end of this article and such State publications upon the subject as may be secured. The attention given general information concerning the subject will depend upon the time available. Time should be taken to discuss the following topics if only in a brief way: (1) Importance of concrete in modern building, (2) comparison of concrete with other materials for farm use, and (3) principles underlying the use of cement.

#### PRACTICUMS.

All of the work suggested is suitable for class practicums at the school. If the school has no equipment or there is no concrete construction to be done at the school, it may be possible for the class to do the work on some neighboring farm. The work may be done also by the students as individual home practicums. After the student has learned to make concrete and something of its general use at school, he should be encouraged to apply such school training to construction at home by being given credit for work properly done.

*Examination of material.*—One of the first things to be done in planning concrete construction is to learn from what source the necessary sand, gravel, crushed rock, and cement may be obtained, and then to examine that material to learn if it is suitable and determine in what proportions it shall be used. As special attention should be given the sand, samples brought by the students from different sources should be tested as to coarseness with screens and for the amount of clay by mixing with water according to directions on page 8 of the bulletin. Students should determine what any proposed work will cost.

*Making equipment and forms.*—In making equipment for mixing, the number of students to be working at one time must be considered along with the amount of work to be done. The students should begin by making the necessary measuring boxes and mixing board. Whatever forms are needed may be made at the same time the measuring boxes and platform are made.

*Mixing the concrete.*—After the students have examined the material and determined the proportions of materials with relation to both the class of material and the nature of the work to be done each student should take part in mixing. If any concrete construction is going on near the school a visit as a class or by individual students will be profitable, especially if a mixing machine is in operation.

*Concrete construction.*—It is much better to have the students make farm equipment if such work can be planned. At most schools there will be walks, steps, and such work that will afford practice of value if there is no opportunity to make farm devices. The work should be



planned for such a time as there is little danger of freezing or other unfavorable weather conditions. Complete directions as to the details of the work are given in the bulletin.

#### REFERENCES.

- The Construction of Concrete Fence Posts, Farmers' Bulletin 403 (1910).  
 The Use of Concrete on the Farm, Farmers' Bulletin 461 (1911).  
 Concrete Construction on the Live-stock Farm, Farmers' Bulletin 481 (1912).

### PRODUCTION OF CLEAN MILK.

#### SUGGESTIONS FOR TEACHING THE SUBJECT IN SECONDARY SCHOOLS.<sup>1</sup>

##### INTRODUCTION.

The very wide use of milk as food has made the production of clean milk a very important question among all classes of people. The milk question is often a very grave one to both consumer and producer. While much has been done by civic control toward improving conditions under which milk is produced and handled, the health regulations which have been passed have in most cases been the result of a wider education of the public mind to the dangers of dirty milk. The enforcement of existing laws as well as improved regulations depend upon educational efforts. A thorough understanding of the nature and value of milk as food and the dangers which may lie in this food as a carrier of disease is dependent upon a knowledge of natural science not common to those who have not had the advantage of schooling above the elementary school. This subject furnishes an excellent opportunity for application of considerable science usually taught in the secondary school. It should find a place in the instruction of both city schools and those of rural districts. If the subject is taught effectively the adult patrons of the school may be reached through the students, as illustrated in a Western city where, through the efforts of a high-school teacher and his students, the whole community was aroused to an interest which resulted in better methods of marketing milk.

##### RELATION TO COURSE OF STUDY.

*Relation to science course.*—A consideration of milk as a food is generally considered a phase of human physiology and hygiene. An understanding of its composition and the changes undergone in its decomposition depend upon a knowledge of chemistry. A study of the reason for changes which take place and a consideration of milk as a carrier of disease germs call for knowledge of bacteriology. The secretion of milk by a large group of animals connects the study with zoology. These facts, in connection with the importance of milk in relation to agriculture and human life, should make this subject important in a course in general science. The milk question from the consumer's point of view is very properly an important phase of domestic science. To properly understand the nature and use of milk as food in these courses, some attention should be given to the production of milk, and in courses in agriculture to understand the question from the producer's point of view some attention should be given milk as food. Wherever more than one of the courses named are given in the same school, especially where they are given to the same students, there should be close correlation and cooperation in the teaching of this subject.

*Relation to course in agriculture.*—Although the milk question is of general interest to all people, and may be considered from different angles of science, its production from a practical point of view is of interest to most farmers and to dairymen, hence it should become a part of the courses in agriculture and dairy husbandry. As the teaching of a special course in dairy husbandry calls for equipment and specialization beyond the reach of the majority of high schools, the subject is mostly taught as a phase of a more general course in animal husbandry.

<sup>1</sup> Based on Farmers' Bulletin 602.



The extent to which the subject is treated will depend upon the time available, the maturity and previous training of the students, and the needs of the community. Where students have had no other science it will be necessary for the teacher of agriculture to spend more time upon fundamental principles in order that students may understand why certain practices are essential. A discussion of the composition and secretion of milk should precede the instruction on the production of clean milk.

#### CLASSROOM INSTRUCTION.

Farmers' Bulletin No. 602, Production of Clean Milk, may furnish a basis for instruction in a general course. In extending the lessons this publication may be supplemented with other bulletins listed. The teacher will find a number of good reference books which have been recently published and which approach the subject from different angles. Special assignments may be given to the class or to individuals in adapting the subject to the needs of the class and community. The teacher will find a good many pertinent articles dealing with this subject in newspapers, farm journals, and magazines. If files are not kept of these papers the articles should be clipped and filed so that they may be used by the class. Questions and other suggestions upon the topics as treated in the bulletin follow.

*Introduction. Definition of clean milk.*—(After having answered the following questions satisfactorily to the instructor the pupils may be called upon for a definition of clean milk.) Why should every owner of a dairy herd be interested in this bulletin? Why should all who handle milk understand its nature? Why should the consumer understand how clean milk is produced? What is clean milk as the term is ordinarily applied? What is the condition of milk as it is secreted in the udder of a healthy cow? How does the milk become contaminated? How may diseases or abnormal conditions of the cow affect the milk?

*Bacteria in milk.*—(If the students have had no previous lessons upon the general nature of bacteria it will be necessary at this time to consider their relation to other plants and animals, their size, conditions essential to growth, and such other topics as may be necessary to give the students a correct understanding of their general nature. A good microscope with slides showing different types of bacteria, properly mounted and stained, will be helpful. After this general discussion they should understand why milk is such a favorable medium for the growth of so many species of bacteria. In discussing the effect of temperatures upon the growth of bacteria it will be worth while to point out the fact that, while refrigeration may keep milk from souring, other changes may go on due to the activity of bacteria which develop at a lower temperature than that needed for those which produce lactic acid.) How is lactic acid produced? Why does sour milk curdle? How does putrefaction differ from other decomposition? How may putrefaction be detected? Upon what factors does the number of bacteria in milk depend?

*Sources of milk contamination.*—From what sources do the bacteria enter the milk? What is likely to be the source of greatest numbers? How may disease germs get into the milk? What diseases are especially liable to be carried in milk? How may the consumer be responsible for contamination? What precautions should be taken by the milkman and consumer in case of any contagious disease?

*Importance of clean milk to the consumer.*—What can you say of the modern awakening with regard to the sanitary production and handling of food? Why should the consumer be especially careful in regard to the milk he buys? What especially dangerous disease has been in some cases traced to infection from the milk of diseased animals? What is the greatest factor in preventing contamination? What other losses may fall upon the consumer, in addition to danger of disease, in buying unclean milk?

*Importance of clean milk to the producer.*—In a general way how may the benefits of clean milk to the producer compare with those to the consumer? How does the tuberculin test



affect the profits of the producer? What may happen if the dairyman ships milk of an inferior grade to market? What can you say of the money value of a good reputation? How may the farmer's family be affected by careless methods in the handling of milk? What diseases of calves may usually be traced to unclean methods of feeding milk? How may methods of milk production have a moral effect on the producer?

*The cost of milk.*—How have the consumers been responsible in part for unclean milk? Why is an unwillingness to pay extra for clean milk poor economy? Why should we expect to pay more for clean milk than for dirty milk? What other factors have contributed to the increased cost of milk? What are the essentials of good dairy management which may aid the farmer in cutting down the cost of production?

*The cows and their care.*—Why may healthy cows be considered one of the first essentials in clean milk production? How may the farmer guard against tuberculosis? What precautions must be taken, if any, if the animals react to the tuberculin test? What are indications of abnormal udder conditions? Why should milk not be used for five days after calving? How may powerful drugs given to the cow affect the milk? Why is cleaning and grooming of the cow's body more important than such care given to a horse? What must be done to cows on pasture and in the stable to aid in keeping them clean? When is the best time for grooming? For attending to the bedding? Why should the manure be removed some distance from the stable? (At this time it is well to emphasize the manner in which milk and its products will absorb odors.) What connection is there between the care of manure and the number of flies? (If this subject is discussed in the fall when flies are most troublesome, the student may be assigned the making of fly traps according to directions given in Farmers' Bulletins 532 and 540, as practicums either at home or in the school shop in connection with farm mechanics if such a course is given.) What advantage do you suppose the open shed would have over the closed stable in regard to the health of the cows? Why should moldy and decayed food be avoided? What precautions should be used in regard to feeding forage of strong flavor and odor? (In sections where the pastures are overrun with wild onion the class may consider, in connection with these lessons, Farmers' Bulletin 608, Removing Garlic Flavor from Milk and Cream.) Under what conditions may the feeding of silage affect the quality of the milk? Why do some health authorities forbid the use of brewers' and distillers' grains? From the point of view of cleanliness when is the best time to feed? Discuss the importance of an abundant supply of fresh, pure water.

*The stable.*—Why is the site of the stable with reference to drainage important from a sanitary point of view? What care should be taken in regard to the silo? Describe an ideal site with ideal surroundings for a dairy barn. What are the undesirable features most often found in dairy barns? How may good barn construction aid in sanitary methods of handling milk? What are the points in favor of a cement floor and what objections are there to it? Describe the most satisfactory gutters. The most satisfactory stalls. What attention should be given the ceiling and walls? Why is an abundance of light and sunshine important in sanitation? What is the relation of light and an abundance of fresh air to the health of the cow?

*The milk house.*—What are the most important factors to bear in mind in locating the milk house? Describe an ideal location. What precautions must be taken if the milk house is in the same building as the stable? What are the most essential factors to keep in mind in planning a dairy house? Why should the interior be as plain as possible and so constructed as to withstand frequent washing? Why are windows important? Discuss the need and use of a supply of pure, cold running water. Of an abundance of hot water. What dangers lie in the use of impure water?

*Utensils.*—In a general way what points should be kept in mind in selecting utensils? Why are wood utensils objectionable. Why is it important to have a supply of steam or hot



water? What is meant by sterilization? How do some bacteria escape ordinary scalding or other conditions unfavorable to their growth? Why should one not depend merely upon the appearance of cleanliness? Why is it necessary to use cold water in rinsing milk vessels before hot water is applied? Why are brushes preferable to cloths? Why is it inadvisable to wipe dairy utensils? Describe the sterilization of utensils and cloths.

*Milking.*—Under what conditions should the milking be done for the best results? What attention should be given the cow before milking? What precautions should be taken in regard to the milker? Describe the attire and equipment of a milker who is to do clean work. Compare the open and small top milk pails with regard to efficiency in keeping milk clean. Why should the wetting of the hands not be permitted? Describe good milking.

*Handling the milk.*—Why should the milk be weighed? Strained? Cooled at once? Describe the most efficient kind of strainer. Why should the milk be tested? (Although the testing of milk is a process to be learned by practice the students should understand the principles underlying the process, something of the history of milk testing and its importance to the dairy industry. These topics are important enough to be considered in a special lesson.) Describe the process of pasteurization. Explain the principles which underlie the process. Why can not market milk be sterilized? What are the advantages of pasteurization? What abuses may arise from its practice? Describe the most satisfactory method of cooling milk. Give a summary of the most essential factors in the production of milk that is clean and safe. (To impress these factors upon the minds of the students they should be written on the blackboard. It will prove profitable to require each student to work out as a written exercise a set of rules to follow in clean dairy practice.)

#### PRACTICUMS.

Most of the schools which give a special course in dairy husbandry are provided with equipment for the handling of milk. In such courses abundant practice should be given in straining and cooling, testing, pasteurization, and the cleaning of utensils in addition to whatever work in dairy manufacture may be offered. Schools not provided with a dairy may make their work more practical by correlating the work of the students at home with the course given at the school. The following suggestions are given to aid the teacher in accomplishing this aim:

*Clean milking.*—Each student in dairying should be able to milk a cow in a sanitary and skillful manner. To check up on this accomplishment the teacher should have each student furnish a written report of a milking, giving a detailed description of the conditions under which he worked, the amount of milk, and the time required. A sample of the milk should be submitted by the student and kept by the teacher long enough to ascertain its keeping quality as an indication of its cleanliness.

*Scoring dairy farms.*—The use of the score card for dairy farms given in the bulletin affords an excellent opportunity for review and application of the facts brought out in the classroom discussion. If it is possible, the instructor should make arrangements for the class to visit a neighboring farm and use the card. This should not be attempted without the consent of the owner. Each student should make an independent score, after which the scores may be discussed and compared. It will be advisable in most cases to conduct the discussion in the classroom in the absence of the owner of the farm. After the students have had this practice as a class practicum each student should be required to score the home dairy or that of some other school patron if it can be arranged. If tact is used by the teacher and students permission may be secured for the scoring of farms and the work made helpful to the school patrons as well as the students.



## A HOME PROJECT.

It may be possible for some of the students to take care of one or more cows on their own account and dispose of their product as market milk. Such a project affords an excellent opportunity for an application of the principles and practices of sanitary milk production. If it can be arranged for the student to do the work himself and correlate it in a definite way with the instruction at school, credit should be given for the work done as a part of the instruction in dairying. The interest of the student will be greatly increased if he is allowed to participate in the profits of the project. Any home project calls for cooperation between the parents, pupils, and teacher. The instructor or some other competent person should supervise the work.

In cases where the father of the student is in the market-milk business and the score of his farm ranges low it may be possible to make arrangements with the father to let his son undertake the improvement of conditions to raise the score. Such work should be accepted as suitable for a home project in connection with milk production and given school credit according to the work done and the results obtained.

## REFERENCES.

- The Use of Milk as Food. Farmers' Bul. 363 (1909).  
 The Care of Milk and Its Use in the Home. Farmers' Bul. 413 (1910).  
 Bacteria in Milk. Farmers' Bul. 490 (1912).  
 Chemical Testing of Milk and Cream. U. S. Dept. Agr., Bur. An. Ind. Doc. A-7 (1916).  
 The Production of Clean Milk. Farmers' Bul. 602 (1915).

A complete list of U. S. Department of Agriculture publications on dairying, arranged for employed teachers, will be furnished by this office to all who may be interested.

## BRIDGE GRAFTING OF FRUIT TREES.

SUGGESTIONS FOR TEACHING THE SUBJECT IN SECONDARY SCHOOLS.<sup>1</sup>

## INTRODUCTION.

Various methods of budding and grafting are usually considered a part of a course in horticulture in connection with plant propagation. Considering the fact that most farmers buy their nursery stock it would seem that a relatively too great emphasis is often placed on this subject. Although the future farmers may not produce their own trees for planting they should understand the principles and practices of grafting that they may apply them in the case of top-working fruit trees or in repairing injuries. As this work involves considerable knowledge and skill it has high educational value.

## RELATION OF SUBJECT TO COURSE OF STUDY.

This subject comes naturally as a phase of horticulture or in connection with fruit growing in a course in general agriculture. Although it is not in a strict sense a phase of propagation it may be considered at the same time budding and grafting are discussed as a means of propagation as it involves the same general principles and similar practices.

An intelligent understanding of any method of grafting trees is based upon a knowledge of how endogenous plants grow, especially how they increase in diameter, how the sap circulates, and how wounds are healed. If the students have had these subjects as a phase of botany, a brief review of them should be given in their application to grafting. If the students have not had this phase of botany it will be necessary to spend more time in a consideration of those phases of plant anatomy and physiology which underlie the practice of grafting.

<sup>1</sup> Based on Farmers' Bulletin 710.



## CLASSROOM INSTRUCTION.

*Principles underlying injury and repair.*—In considering these principles with students who have not had botany it will be necessary to supplement the bulletin by making assignments to the chapters on plant growth in a botany text. The following questions are suggestive of topics to be developed: How does the tree increase in diameter? What is the function of the outer and inner layers of bark? What will determine the length of time a tree may live after it is girdled? How are wounds healed in trees? To what extent will a girdled tree heal naturally? (In bringing out the effect of girdling upon a tree the practice of girdling to induce fruiting may be discussed.) What is the idea which underlies bridge grafting? Why must the cambium layers be brought together? What are the essential steps in securing a graft union? At what season must grafting be performed?

*Causes of injury.*—Since much of the girdling of trees is caused by animals, this phase of the subject calls for correlation with zoology. If there is any great amount of injury to orchards from mice, gophers, and rabbits, the habits of these animals should be discussed with methods for their control. The publications dealing with these pests which are listed at the end of Farmers' Bulletin 710 may be studied in connection with that bulletin, and the trapping and other methods of control made a part of the practical work of the class.

Although pear blight is a cause of injury, this subject may be considered separately or in connection with the pruning of pear and apple trees. Sunscald, likewise a cause of injury, may be more properly considered in connection with the heading and pruning of trees.

*Prevention of injury.*—Under this heading there is a good opportunity to impress the need of care in cultivation to avoid injury of the trees. Orchard sanitation with regard to the accumulation of rubbish about trees may be emphasized as well. The use of wire netting and tarred paper as a means of protection may be made a feature of the practical work where injury is extensive. Although students should be able to recognize those borers which prove troublesome in the district, a study of borers and method of control will fit better with that part of the course which deals with insects.

## PRACTICUMS.

*Making of grafting wax.*—As a preliminary to any work in grafting each student should participate in making grafting wax. A good grafting wax may be made of the following ingredients: Resin, 4 parts; beeswax, 2 parts; tallow or linseed oil, 1 part by weight. If a harder wax is needed, 5 parts of resin and  $2\frac{1}{2}$  of beeswax may be used with 1 part of tallow. The resin and beeswax should be broken up fine and melted together with the tallow. When thoroughly melted the liquid should be poured into a vessel of cold water. As soon as it becomes hard enough to handle it should be taken out and pulled and worked until it becomes tough and has the color of a very light-colored manila paper. If the wax is applied by hand the hands should be well greased, tallow being the best material for this purpose. The wax should be applied either by hand or when hot with a brush, but with hot wax care is necessary in order to avoid injury.

*Bridge grafting.*—Complete directions for this grafting are given in the bulletin. As the treatment depends upon the nature of the injury, a number of trees should be treated by the students. If the injured trees are convenient to the school the work may be conducted as a class practicum, each student participating in the work as far as possible. The teacher should insist upon extreme care in each step that the chances for failure may be reduced to a minimum. In order to increase skill encouragement should be given the students to treat trees at home. School credit may be given to home work which is properly done in connection with the work of the school.